**The City School**



**Syllabus for Physics Class 9**

**Session 2017 – 18 (Final Term)**

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| **Contents** | **Learning Objectives** |
| **Physical Quantities, Units and Measurements** |  *Define Physical quantities*   *Enlist the base quantities with their base units and symbols and know that these are seven*   *Explain derived units with examples*  *(a)* define the terms *scalar* and *vector*.  *(b)* determine the resultant of two vectors by a graphical method.  *(c)* list the vectors and scalars from distance, displacement, length, speed, velocity, time, acceleration,  mass and force.  *(d)* describe how to measure a variety of lengths with appropriate accuracy  using tapes, rules, micrometers  and calipers. (The use of a vernier scale is **not** required.)  *(e)* describe how to measure a variety of time intervals using clocks and stopwatches.  *(f)* recognise and use the conventions and symbols contained in ‘Signs,  Symbols and Systematics’,  Association for Science Education, 2000. |
| **Kinematics** | *(a) state what is meant by speed and velocity.*  *(b) recall and use average speed = distance travelled/time taken. (c) state what is meant by uniform acceleration and recall and use acceleration = change in velocity/time*  *taken.*  *(d) discuss non-uniform acceleration.*  *(e) recall that deceleration is a negative acceleration.*  *(f) \*plot and \*interpret speed-time and distance-time graphs.*  *(g) \*recognise from the shape of a speed-time graph when a body is*  *(1) at rest,*  *(2) moving with uniform speed,*  *(3) moving with uniform acceleration,*  *(4) moving with non-uniform acceleration.*  *(h) calculate the area under a speed-time graph to determine the distance travelled for motion with uniform*  *speed or uniform acceleration.*  *(i) state that the acceleration of free-fall for a body near to the Earth is constant and is approximately*  *10 m / s2.*  *(j) describe qualitatively the motion of bodies with constant weight falling with and without air resistance (including reference to terminal velocity).* |
| **Dynamics** | *(a)* state Newton’s third law.  *(b)* describe the effect of balanced and unbalanced forces on a body.  *(c)* describe the ways in which a force may change the motion of a body.  *(d)* recall and use the equation *force* = *mass* × *acceleration*.  *(e)* explain that friction is a force that impedes motion and produces heating.  *(f)* discuss the effect of friction on the motion of a vehicle in the context of  tyre surface, road conditions  (including skidding), braking force, braking distance, thinking distance and stopping distance.  *(g)* describe qualitatively motion in a circular path due to a constant  perpendicular force, including  electrostatic forces on an electron in an atom and gravitational forces on a satellite. (*F* = *mv* 2*/r* is **not**  required.)  *(h)* discuss how ideas of circular motion are related to the motion of planets  in the solar system. |
| **Mass, Weight and Density** | *(a)* State that mass is a measure of the amount of substance in a body. *(b)* State that the mass of a body resists change from its state of rest or motion.  *(c)* State that a gravitational field is a region in which a mass experiences a  force due to gravitational attraction.  *(d)* Calculate weight from the equation *weight* = *mass* × *gravitational field strength*.  *(e)* Explain that weights, and therefore masses, may be compared using a  balance.  *(f)* Describe how to measure mass and weight by using appropriate  balances.  *(g)* Describe how to use a measuring cylinder to measure the volume of a  liquid or solid.  *(h)* Describe how to determine the density of a liquid, of a regularly shaped  solid and of an irregularly shaped solid which sinks in water (volume by displacement).  (i) Make calculations using the formula *density* = *mass/volume*. |
| **Turning Effect of Forces** | *(a)* Describe the moment of a force in terms of its turning effect and relate this to everyday examples.  *(b)* State the principle of moments for a body in equilibrium.  *(c)* Make calculations using *moment of a force* = *force* × *perpendicular distance from the pivot* and the principle of moments.  *(d)* Describe how to verify the principle of moments.  *(e)* Describe how to determine the position of the centre of mass of a plane lamina.  *(f)* Describe qualitatively the effect of the position of the centre of mass on  the stability of simple objects. |
| **Deformation** | *(a) state that a force may produce a change in size and shape of a body. (b) \*plot, draw and interpret extension-load graphs for an elastic solid and describe the associated*  *experimental procedure.*  *(c) \*recognise the significance of the term “limit of proportionality” for an*  *elastic solid (an understanding of the elastic limit is not required).*  *(d) calculate extensions for an elastic solid using proportionality* |
| **Pressure** | *(a)* Define the term *pressure* in terms of force and area, and do calculations using the equation *pressure* = *force/area*.  *(b)* Explain how pressure varies with force and area in the context of everyday examples.  *(c)* Describe how the height of a liquid column may be used to measure the  atmospheric pressure.  *(d)* Explain quantitatively how the pressure beneath a liquid surface changes  with depth and density of the liquid in appropriate examples.  *(e)* Do calculations using the equation for hydrostatic pressure *p* = *ρgh*.  *(f)* Describe the use of a manometer in the measurement of pressure  difference.  *(g)* Describe and explain the transmission of pressure in hydraulic systems  with particular reference to the hydraulic press and hydraulic brakes on vehicles.  *(h)* Describe how a change in volume of a fixed mass of gas at constant  temperature is caused by a change in pressure applied to the gas.  *(i)* Do calculations using *p*1*V*1 = *p*2*V*2. |
| **Energy Sources and transfer of Energy** | *(a)* List the different forms of energy with examples in which each form occurs.  *(b)* State the principle of the conservation of energy and apply this principle  to the conversion of energy from one form to another.  *(c)* State that kinetic energy is given by *E*k = ½*mv* 2 and that gravitational potential energy is given by *E*P = *mgh*, and use these equations in  calculations.  *(d)* List renewable and non-renewable energy sources.  *(e)* describe the processes by which energy is converted from one form to  another, including reference to  (1) chemical/fuel energy (a re-grouping of atoms),  (2) hydroelectric generation (emphasising the mechanical energies involved),  (3) solar energy (nuclei of atoms in the Sun), (4) nuclear energy,  (5) geothermal energy, (6) wind energy.  (f) Explain nuclear fusion and fission in terms of energy-releasing processes.  (g) Describe the process of electricity generation and draw a block diagram of the process from fuel input to electricity output.  (h) Discuss the environmental issues associated with power generation.  (i) Define work done and use the formula work = force × distance moved in the line of action of the force.  (j) Recall and use the formula efficiency = energy converted to the required form/total energy input for an energy conversion.  (k) Discuss the efficiency of energy conversions in common use, particularly those giving electrical output.  (l) Discuss the usefulness of energy output from a number of energy  conversions.  (m) Define power and recall and use the formula power = work done/time taken. |
| **Transfer of Thermal Energy** | (a) describe how to distinguish between good and bad conductors of heat. (b) describe, in terms of the movement of molecules or free electrons, how heat transfer occurs in solids.  (c) describe convection in ﬂuids in terms of density changes.  (d) describe the process of heat transfer by radiation.  (e) describe the effect of surface colour (black or white) and texture (dull or shiny) on the emission,  absorption and reﬂection of radiation.  (f) describe how to distinguish between good and bad emitters and good and bad absorbers of infra-red  radiation.  (g) describe how heat is transferred to or from buildings and to or from a room.  (h) state and explain the use of the important practical methods of thermal insulation for buildings. |
| **Thermal properties of matter** | (a) state the distinguishing properties of solids, liquids and gases.  (b) describe qualitatively the molecular structure of solids, liquids and gases, relating their properties to the  forces and distances between molecules and to the motion of the molecules. (c) describe the relationship between the motion of molecules and temperature.  (d) explain the pressure of a gas in terms of the motion of its molecules.  (e) describe evaporation in terms of the escape of more energetic molecules from the surface of a liquid.  (f) describe how temperature, surface area and draught over a surface  inﬂuence evaporation.  (g) explain that evaporation causes cooling |